

- STEP #4** Change the frequency of the CW signal generator to the frequency of an equivalent in-band interfering signal (signal substitute reference signal). The frequency of the image reference signal will be approximately equal to the desired video carrier frequency plus 1.5 MHz (for test channel 3, the reference signal will be approximately 62.75 MHz). Note that the reference signal produces a similar spectral line in the baseband spectral display as that produced by the image carrier.
- STEP #5** Adjust the CW generator output level until the level of the reference interfering signal, as viewed in the baseband spectral display, is equal to the level recorded in STEP #3. Record the CW generator setting. The difference (in dB) of the generator output setting required to produce the image channel carrier at a level of +13 dBmV (recorded in STEP #3 of the calibration procedure) and the final generator output setting of the reference signal (recorded in STEP #5) is the image channel rejection for the first test channel.
- STEP #6** Repeat STEP #1 through STEP #5 for each of the remaining test channels. The approximate frequency of the signal substitute reference signal for each of the test channels is as follows:

Approximate Reference Frequency for Image Measurement:

- Channel 3: 62.75 MHz
- Channel 12: 206.75 MHz
- Channel 53: 398.75 MHz
- Channel 74: 524.75 MHz

#### 4.4.9 Tuner Overload

Tuner overload measurements are performed with the desired test channel's aural and visual carriers offset downward in frequency by 80 kHz. The frequency offset is necessary to resolve the Composite Triple Beat product, which would otherwise fall on the desired video carrier frequency. The test procedure is similar to the adjacent channel and image channel procedures described in the preceding two sections. An initial calibration is performed to establish the input levels at each test frequency, followed by the actual measurement procedure which employs signal substitution for the measurement.

#### 4.4.9.1 Test Conditions

Test Channels: 3, 12, 53, and 74  
Offset Desired Carrier Frequencies:

<u>Test Channel</u>	<u>Video Carrier</u>	<u>Aural Carrier</u>
- Channel 3	61.17 MHz*	65.67 MHz*
- Channel 12	205.17 MHz*	209.67 MHz*
- Channel 53	397.17 MHz*	401.67 MHz*
- Channel 74	523.17 MHz*	527.67 MHz*

\*Assigned Carrier Frequency Minus 80 kHz

Other Carrier Frequencies:

- All video carriers from channel 2 through channel 78, excluding the desired and image carriers.

Test Signal Amplitudes (at the EUT RF input port):

- Desired Video Carrier: +15 dBmV
- Desired Aural Carrier: +5 dBmV
- Other Video Carriers: +15 dBmV

Modulation:

- Desired Video Carrier: 0 or 10 IRE Flat Field
- Desired Aural Carrier: Unmodulated
- Other Video Carriers: Unmodulated

#### 4.4.9.2 Initial Calibration

- STEP #1** Configure the test system and EUT as shown in Figure 4.14.
- STEP #2** With the Matrix generator disabled, adjust the TV signal generator (desired channel) for the desired video and aural carrier frequency offsets, levels, and modulation as measured at the input to the EUT. Record generator/attenuator settings for each test channel.
- STEP #3** With the desired TV signal generator disabled, adjust the Matrix generator level controls so that each carrier is present at the input to the EUT at a level of +15 dBmV. Do not change individual carrier levels after this step.

**STEP #4** With both the desired TV signal generator and Matrix signal generator disabled, set the reference CW signal generator to a frequency 0.5 MHz above the desired channel video carrier frequency and adjust for a level of +15 dBmV as measured at the input connector of the EUT. Record the generator output level. Repeat this step for all four test channels.

Note: When testing a cable converter, install the demodulator at the RF output port of the converter to provide the baseband video signal.

#### 4.4.9.3 Measurement Procedures

**STEP #1** With the Matrix generator disabled, adjust the TV signal generator (desired channel) to the settings obtained in STEP #2 of the calibration procedure for the first test channel.

**STEP #2** Prior to activating the Matrix generator, disable the desired video carrier and the image video carrier on the Matrix generator. After disabling these carriers, turn on the Matrix generator and verify that all other carriers between 54 MHz and 550 MHz are present at the input to the EUT.

**STEP #3** Set up the VM 700A television measurement set to display the noise spectrum of Field 1, Line 16 (0 IRE flat field). [Note: Verify that the EUT baseband signal is normalized to 1 Volt (Peak).] Scan the noise spectral display of the VM 700A (averaging mode) for in-band interfering signals. If present, CTB products will appear at approximately 0.08 MHz in the baseband display. CSO products will appear at 0.83 MHz and/or 1.33 MHz. Note that these products will appear 0.08 MHz higher than normal due to the offset of the desired channel. Other distortion products may also appear in the baseband display. Record the frequency and magnitude of each interfering signal.

Note: If no interfering signal is present, the level of the resultant interfering signals are below the noise floor of the EUT. In this circumstance, record the noise floor level and proceed to the next test channel (STEP #7).

- STEP #4** Disable the Matrix generator and turn on the reference CW signal generator. For each interfering frequency recorded in STEP #3, a reference signal must be generated and input to the EUT which results in the identical interfering signal in the baseband display (signal substitution). The reference signal frequency will be equal to the desired carrier frequency (with offset) plus the baseband frequency of the interfering signal as recorded in STEP #3. Adjust the reference signal generator output frequency to correspond to the first interfering frequency recorded in STEP #3. Note that the reference signal produces a similar spectral line in the baseband spectral display as that produced by the Matrix generator.
- STEP #5** Adjust the CW generator output level until the level of the reference interfering signal, as viewed in the baseband spectral display, is equal to the level recorded in STEP #3. Record the CW generator setting. The difference (in dB) of the reference generator output level (recorded in STEP #4 of the calibration procedure) and the final reference generator output level (recorded in STEP #5) is the equivalent in-band D/U ratio for the particular distortion product being measured.
- STEP #6** Repeat STEPS 4 and 5 for each of the interfering signals recorded in STEP #3.
- STEP #7** Repeat STEP #1 through STEP #6 for each of the remaining test channels.

#### 4.5 Receiver Performance Test Results

This section presents test results in the eight receiver performance categories for a sample population of 35 television receivers, 8 VCR's and 13 cable converters.

##### 4.5.1 Re-radiation of Cable Signals Test Results

All 56 test samples were tested for re-radiation of cable signals on each of the four test channels, in accordance with the test procedures contained in Section 4.4.2. Devices which were supplied with interconnecting cables were tested with the cables attached to the EUT in a normal configuration and properly terminated.

Prior to commencing the actual performance testing, initial tests were performed on the measurement system and television signal generator and associated coaxial

cable to verify that: 1) the measurement system sensitivity was sufficient for the measurement of cable signal re-radiation, and 2) radiated emissions from the television signal generator and input coaxial cable were well below the expected levels of re-radiation from the test samples.

The FCC regulates radiation from a cable delivery system under Part 76.605(a)(12) of its Rules and Regulations. The limit of radiation from a cable delivery system is 15 microvolts per meter (uV/m), at a distance of 30 meters, for frequencies less than or equal to 54 MHz and greater than 216 MHz; and 20 uV/m, at a distance of 3 meters, for frequencies between 54 MHz and 216 MHz. In order to make meaningful measurements of the re-radiation of cable signals from consumer receiving equipment, the sensitivity of the measurement system and the radiated emissions from the television signal generator and coaxial cable must be less than the FCC limits on each of the four test channels.

The preliminary tests performed at the CTJC test facility verified that the emissions from the television generator and coaxial input cable were less than the sensitivity of the measurement system, and that the measurement system sensitivity was less than the FCC limits. A comparison of the FCC limit and the measurement system sensitivity, for each test channel, is contained in Table 4.1 below. The data contained in Table 4.1 is referenced to a distance of 3 meters.

Test Channel	Frequency (MHz)	FCC Limit (uV/m @ 3 M)	Sensitivity (uV/m @ 3 M)
15	126 - 132	20	10
25	228 - 234	150	13
37	300 - 306	150	14
53	396 - 402	150	23

**Table 4.1 Comparison of FCC Radiation Limit and Measurement System Sensitivity for Each Test Channel**

Tests performed on the total test sample population showed that radiated cable signal emissions, for the majority of receivers tested, were below the minimum sensitivity of the measurement system and, therefore, well below the FCC limits. For devices with two selectable RF input ports, there was no measurable difference in radiated emissions with either input selected.

Cable signal radiated emissions were measurable on six television receivers. The measurement data on the six television receivers is contained in Table 4.2. Radiated emissions (uV/m) are presented in the table for each of the four test channels and for EUT operating and non-operating conditions. The shaded values in Table 4.2 indicate those emission levels which exceed the FCC limits.

In summary, out of the 56 receivers tested, only two exhibited re-radiation of cable signals at levels which exceed the FCC limits for cable delivery systems, as specified in Part 76.605(a)(12) of the FCC's Rules and Regulations.

#### 4.5.2 Local Oscillator Leakage and Backfeed Test Results

Local oscillator leakage and backfeed tests were performed on the total test sample population, in accordance with the procedures contained in Section 4.4.3. The test results are presented in this Section in terms of the voltage appearing at the RF input port of the EUT.

Tests were performed at two different desired video carrier levels, 0 dBmV and +15 dBmV. It was determined from the test results that local oscillator leakage and backfeed are independent of the desired video carrier input level and, therefore, test results are presented for the 0 dBmV input level only.

##### 4.5.2.1 Local Oscillator Leakage Test Results

The local oscillator leakage test results are presented in Tables 4.3 through 4.5 for television receivers, VCR's, and cable converters, respectively. Results are presented for each test sample in terms of the voltage appearing at the input port of the receiver, in units of decibels above one millivolt (dBmV).

The "less than" symbol (<) in the tables indicates that the local oscillator signal level was less than the sensitivity of the measurement system. The value following the "less than" symbol is the measurement system sensitivity for the specific channel under study.

Shading is used in the tables to highlight those voltage levels which could potentially cause "just perceptible" or greater interference in another subscriber's receiver. The minimum level of local oscillator leakage required to create "just perceptible" interference in another subscriber's receiver is dependent on the isolation between subscribers and the desired signal level at the other subscriber's receiver input port.

**TABLE 4.2**  
**RADIATED EMISSIONS**  
**TELEVISION RECEIVERS**

SAMPLE NO.	FIELD STRENGTH ( $\mu\text{V/m}$ )							
	CHANNEL 15		CHANNEL 25		CHANNEL 37		CHANNEL 53	
	POWER ON	POWER OFF	POWER ON	POWER OFF	POWER ON	POWER OFF	POWER ON	POWER OFF
007	*	*	17.8	13.5	19.0	19.9	34.7	30.9
016	*	*	26.3	26.3	*	*	*	*
019	13.3	*	*	*	*	*	*	*
021	14.9	13.9	27.5	51.3	*	*	*	*
027	14.9	*	87.1	125.9	114.8	177.8	295.1	436.5
028	16.4	*	97.7	144.5	69.2	194.9	223.9	338.8

\* Measured field strength below measurement system sensitivity.

Exceeds emission limits specified in Part 76.605(a)(12) of the FCC Rules.

**TABLE 4.3**  
**LOCAL OSCILLATOR LEAKAGE**  
**TEST RESULTS**

**TELEVISION RECEIVERS**

SAMPLE NO.	CHANNEL 3 dBmV	CHANNEL 12 dBmV	CHANNEL 53 dBmV	CHANNEL 74 dBmV
001	-41.2	-42.9	-26.0	-18.9
002	-35.9	< -48.9	-28.4	-30.2
003	-35.9	< -48.9	-26.6	-29.5
004	< -49.2	< -48.9	-42.6	-36.6
005	< -49.2	-44.8	-42.3	< -42.4
006	-46.8	-45.6	-34.4	-24.5
007	< -49.2	< -48.9	-42.0	-31.0
008	-49.0	< -48.9	-42.5	-35.4
009	< -49.2	-37.3	-35.7	-32.8
010	< -49.2	-41.2	-35.1	< -42.4
011	< -49.2	< -48.9	< -45.2	< -42.4
012	-40.5	-29.9	-32.6	-21.9
013	-45.0	-45.8	-35.7	-22.4
014	-37.0	-38.5	-34.9	-29.3
015	< -49.2	-40.6	-37.5	-28.9
016	-38.8	< -48.9	-43.3	< -42.4
017	< -49.2	-44.8	-44.6	-19.0
018	-38.9	-30.8	< -45.2	< -42.4
019	-38.1	-37.2	-26.9	-26.0
020	< -49.2	< -48.9	-34.7	-37.2
021	< -49.2	-36.8	-30.8	-20.7
022	-41.9	< -48.9	< -45.2	-37.5
023	< -49.2	< -48.9	-43.7	-28.5
024	-40.9	-20.6	-26.8	-27.1
025	-45.1	< -48.9	< -45.2	-40.5
026	-47.5	-20.5	-24.7	-30.0
027	-44.3	-28.7	-43.3	-20.6
028	-39.3	-19.6	-15.0	-27.7
029	-35.5	-40.4	-25.8	-24.9
030	-44.5	< -48.9	-37.8	-32.3
031	-39.1	-36.6	-37.1	-34.4
032	-44.8	-45.1	-24.4	-30.1
033	-45.8	< -48.9	< -45.2	< -42.4
034	-41.6	< -48.9	< -45.2	< -42.4
035	< -49.2	< -48.9	< -45.2	< -42.4

NOTE: A "less than" symbol (<) indicates that the level is less than the measurement system sensitivity.

 Level exceeds "just perceptible" interference threshold.



**TABLE 4.4**  
**LOCAL OSCILLATOR LEAKAGE**  
**TEST RESULTS**

**VIDEO CASSETTE RECORDERS**

SAMPLE NO.	CHANNEL 3 dBmV	CHANNEL 12 dBmV	CHANNEL 53 dBmV	CHANNEL 74 dBmV
101	-34.0	-40.4	< -45.2	-36.1
102	-44.8	-35.7	-40.5	-21.6
103	< -49.2	-45.6	< -45.2	< -42.4
104	< -49.2	< -48.9	-33.0	-35.1
105	< -49.2	< -48.9	< -45.2	< -42.4
106	-37.1	-35.6	-37.4	-10.4
107	-35.2	-31.4	-36.8	-12.2
108	-28.4	-38.1	-25.0	-26.7

NOTE: A "less than" symbol (<) indicates that the level is less than the measurement system sensitivity.

 Level exceeds "just perceptible" interference threshold.

**TABLE 4.5**  
**LOCAL OSCILLATOR LEAKAGE**  
**TEST RESULTS**

**CABLE CONVERTERS**

SAMPLE NO.	CHANNEL 3 dBmV	CHANNEL 12 dBmV	CHANNEL 53 dBmV	CHANNEL 74 dBmV
201	< -49.2	< -48.9	< -45.2	< -42.4
203	< -49.2	< -48.9	< -45.2	*
204	< -49.2	< -48.9	< -45.2	*
206	< -49.2	-45.0	< -45.2	-41.1
208	< -49.2	< -48.9	*	*
209	< -49.2	< -48.9	< -45.2	< -42.4
212	< -49.2	< -48.9	< -45.2	< -42.4
214	< -49.2	< -48.9	< -45.2	< -42.4
216	< -49.2	< -48.9	< -45.2	< -42.4
218	< -49.2	< -48.9	< -45.2	< -42.4
220	< -49.2	< -48.9	< -45.2	< -42.4
222	< -49.2	< -48.9	< -45.2	< -42.4
224	< -49.2	< -48.9	< -45.2	*

*NOTE: A "less than" symbol (<) indicates that the level is less than the measurement system sensitivity.*  
*\* Cable converter did not tune to this test channel.*

 *Recorded level exceeds "just perceptible" interference threshold.*

The FCC requires a minimum of 18 dB of isolation between subscribers. In practice, the minimum isolation is thought to be 22 dB. Assuming that "just perceptible" interference is created at a desired to undesired (D/U) signal level of 55 dB, then for a desired signal level of 0 dBmV, an undesired (interfering) signal level of -55 dBmV at the input to the receiver will result in "just perceptible" interference. Taking into account the 22 dB minimum isolation between subscribers, the minimum level of local oscillator leakage required to create "just perceptible" interference in another subscriber's receiver is -33 dBmV. Test samples exhibiting local oscillator voltage levels greater than or equal to this threshold value are shaded in the tables.

A review of Table 4.3 indicates that local oscillator leakage performance in television receivers degrades with increasing frequency. None of the test samples exhibit performance which exceeds the threshold of "just perceptible" interference on Channel 3. However, on Channel 12, the threshold is exceeded for 17% of the test samples, 31% exceeded the threshold on Channel 53, and 60% exceeded the threshold on Channel 74. A similar pattern is exhibited in Table 4.4 for VCR's.

Television receivers and VCR's exhibited the highest levels of local oscillator leakage. The highest local oscillator voltage measured for a television receiver was -15 dBmV. The highest level measured for a VCR was -10.4 dBmV.

Test results for cable converters, presented in Table 4.5, show the level of local oscillator leakage in these devices was generally below the sensitivity of the measurement system. It is believed that most, if not all, of the cable converters tested employ double frequency conversion and, therefore, do not create a local oscillator signal within the cable television frequency band.

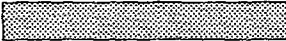
#### 4.5.2.2 Backfeed Test Results

Backfeed, as defined here, is any spurious signal emanating from the EUT which is present at the RF input port. For each standard test channel, the RF input port of each EUT was scanned, over the frequency band from 5 MHz to 600 MHz, in 100 MHz increments. Any spurious signal identified in the scanning process, which was greater than -35 dBmV referenced to the input of the EUT, was recorded.

Table 4.6 presents the results of the backfeed measurements. Only five television receivers and three cable converters were found to have spurious emissions present at their RF input ports which exceeded -35 dBmV. Those emissions which are within the cable delivery system frequency band (54 to 550 MHz) and which exceed the "just perceptible" interference threshold (-33 dBmV) are shaded in the table.

**TABLE 4.6  
BACKFEED TEST RESULTS**

	SAMPLE NO.	CHANNEL 3		CHANNEL 12		CHANNEL 53		CHANNEL 74	
		MHz	dBmV	MHz	dBmV	MHz	dBmV	MHz	dBmV
TELEVISIONS	001	41.26	-34.0	--	--	--	--	--	--
	011	--	--	45.75	-33.9	--	--	--	--
	012	--	--	502.00	-34.0	--	--	--	--
	013	41.22	-32.9	41.22	-32.1	--	--	41.22	-33.2
	019	45.75	-34.6	--	--	45.75	-32.3	45.75	-32.1
VIDEO CASSETTE RECORDERS		There were no emissions found to be greater than -35.0 dBmV							
CABLE CONVERTERS	209	8.02	-25.6	8.02	-25.0	8.02	-20.9	8.02	-18.6
	209	10.53	-20.4	12.80	-24.7	15.80	-31.4	--	--
	212	5.94	-30.7	--	--	--	--	--	--
	224	--	--	144.00	-1.7	336.00	-2.8	--	--

 Emission frequency is within 54 to 550 MHz cable band and level exceeds "just perceptible" interference threshold.

In the case of the five television receivers, the majority of the emissions appear to be associated with the intermediate frequencies of the receiver. In the case of the cable converters, two of the units exhibited emissions at frequencies below the cable delivery system frequency band. Cable converter 224, however, generated emissions on two of the test channels which were within the cable frequency band and were more than 30 dB above the "just perceptible" interference threshold.

#### 4.5.3 A/B Switch Isolation Test Results

Tests were performed on devices equipped with two selectable RF input ports for isolation between the non-selected and selected input port (A to B and B to A) and between the non-selected input port and the output port (A to C and B to C). In addition, tests were performed on each of the VCR's for isolation between the input port and the output port when the VCR is operating in the "VCR Play" mode.

##### 4.5.3.1 Non-Selected to Selected Input Port Isolation Test Results

Input selector switch isolation standards for television receivers are specified by the FCC in Section 15.117(h) of its Rules and Regulations. Under this section of the Rules, isolation must be at least 80 dB between 54 and 216 MHz and at least 60 dB between 216 and 550 MHz. This level of isolation is required whether the device is powered or unpowered.


The non-selected to selected input port isolation test results are presented in Table 4.7 for the eight television receivers which were equipped with two selectable RF input ports. Isolation tests were performed from port A to port B with port B selected, and from port B to port A with port A selected. The tests were repeated with power to the receiver turned off. Shading is used in the table to highlight those measured values of isolation which are less than the FCC standard.

The test results of Table 4.7 indicate that switch isolation performance is generally not symmetric. The isolation from port A to port B may be significantly different than the isolation from port B to port A for the same test sample on the same test channel. Further, there can be significant differences in switch isolation characteristics between power on and power off conditions. The test results also indicate that switch isolation performance degrades substantially with increasing frequency.

**TABLE 4.7**  
**NON-SELECTED TO SELECTED**  
**INPUT PORT ISOLATION**  
**TEST RESULTS**

SAMPLE NO.	CHANNEL 3				CHANNEL 12			
	A TO B ISOLATION (dB)		B TO A ISOLATION (dB)		A TO B ISOLATION (dB)		B TO A ISOLATION (dB)	
	POWER ON	POWER OFF	POWER ON	POWER OFF	POWER ON	POWER OFF	POWER ON	POWER OFF
010	89.5	> 106.9	102.6	> 106.9	91.0	89.7	83.6	88.2
011	> 106.9	> 106.9	89.2	90.6	91.9	86.4	75.2	77.4
013	> 106.9	> 106.9	> 106.9	> 106.9	92.4	85.2	89.1	76.6
014	94.3	74.3	> 106.9	74.5	70.7	87.0	97.5	87.4
016	98.6	97.1	99.3	103.0	100.6	80.1	87.0	83.2
029	89.8	96.5	87.0	90.4	87.9	78.3	84.1	82.4
032	102.9	104.9	89.6	> 106.9	> 106.6	> 106.6	81.4	87.4
035	> 106.9	> 106.9	105.5	> 106.9	79.4	86.0	83.1	84.3


**NOTE:** A "greater than" symbol (>) indicates that the interfering signal was below the sensitivity of the measurement system and, therefore, the actual isolation of the test sample is greater than the value to the right of the symbol.

 Indicates isolation was less than the FCC minimum value of 80dB for frequencies between 54 MHz and 216 MHz.

**TABLE 4.7 (cont'd)**  
**NON-SELECTED TO SELECTED**  
**INPUT PORT ISOLATION**  
**TEST RESULTS**

SAMPLE NO.	CHANNEL 53				CHANNEL 74			
	A TO B ISOLATION (dB)		B TO A ISOLATION (dB)		A TO B ISOLATION (dB)		B TO A ISOLATION (dB)	
	POWER ON	POWER OFF	POWER ON	POWER OFF	POWER ON	POWER OFF	POWER ON	POWER OFF
010	81.0	81.3	78.5	82.2	74.3	76.8	68.3	75.8
011	75.1	71.4	76.2	79.3	77.9	78.9	78.5	79.2
013	71.6	81.8	80.5	85.3	79.2	78.0	82.0	91.1
014	61.1	69.1	81.3	69.1	54.5	62.3	73.0	61.0
016	85.4	67.6	78.5	67.7	83.1	67.1	70.0	66.3
029	76.3	79.7	71.3	67.1	67.4	66.4	65.4	63.8
032	> 106.0	> 106.0	69.4	66.9	> 105.1	> 105.1	58.9	57.4
035	72.6	68.2	70.8	70.0	73.0	63.4	62.8	62.2

**NOTE:** A "greater than" symbol (>) indicates that the interfering signal was below the sensitivity of the measurement system and, therefore, the actual isolation of the test sample is greater than the value to the right of the symbol.

 Indicates isolation was less than the FCC minimum value of 60dB for frequencies between 216 MHz and 550 MHz.

Six of the eight receivers tested exhibited switch isolation performance less than the FCC minimum standard, on at least one test channel, and in at least one of the four configurations tested. Of those six, only one receiver exhibited a switch isolation greater than 6 dB below the standard.

#### 4.5.3.2 Non-Selected Input to Output Port Isolation Test Results

Test results for isolation between the non-selected input port and the output port are presented in Table 4.8. The input to output port isolation tests were performed on eight television receivers in accordance with the procedures described in Section 4.4.4.2.

Tests were performed for isolation between port A and port C with ports B and C common, and between port B and port C with ports A and C common.

The test results of Table 4.8 indicate that there can be significant differences in isolation performance dependent on the selected input port. Further, switch isolation performance between the input and output port degrades substantially with increasing frequency.

For a given undesired signal level at the non-selected input port and a given desired signal level at the selected input port, it is possible to calculate an isolation level which will result in "just perceptible" interference to the received picture. A D/U signal ratio of 55 dB at the output port is assumed to be the "just perceptible" interference threshold.

Given a signal level of +30 dBmV at the non-selected input port and a desired input signal level of 0 dBmV at the selected input port, a switch isolation of greater than 85 dB is required to insure that the resultant interference level is below the "just perceptible" threshold. For such a high level signal at the non-selected port, the majority of the receivers would exhibit interference above the "just perceptible" threshold level on the two UHF channels. For a more reasonable signal level of +15 dBmV at the non-selected input port, an isolation of 70 dB is required to insure that the interference level is below the "just perceptible" threshold. Four of the eight receivers exhibited switch isolation performance below this level on channel 74 for one of the two configurations tested.



**TABLE 4.8**  
**NON-SELECTED INPUT TO OUTPUT**  
**PORT ISOLATION**  
**TEST RESULTS**

SAMPLE NO.	CHANNEL 3		CHANNEL 12		CHANNEL 53		CHANNEL 74	
	A TO C ISOLATION (dB)	B TO C ISOLATION (dB)	A TO C ISOLATION (dB)	B TO C ISOLATION (dB)	A TO C ISOLATION (dB)	B TO C ISOLATION (dB)	A TO C ISOLATION (dB)	B TO C ISOLATION (dB)
010	94.0	> 100.0	> 99.2	85.3	76.1	79.4	70.6	72.6
011	95.8	> 101.0	79.5	> 98.7	81.1	89.4	83.1	95.8
013	> 100.1	> 100.5	97.3	82.4	> 96.4	> 96.9	93.3	> 100.0
014	> 103.0	> 97.0	83.7	> 98.2	73.7	> 97.0	66.4	91.8
016	89.7	96.9	96.1	87.6	77.0	82.6	77.9	77.0
029	95.8	87.7	89.7	89.7	92.2	74.5	77.5	66.0
032	> 98.0	85.9	93.5	86.0	77.1	74.9	72.2	66.4
035	> 101.0	> 97.5	85.6	77.3	*	69.4	*	67.6

*NOTE: A "greater than" symbol (>) indicates that the interfering signal was below the noise floor of the test sample and, therefore, the actual isolation is greater than the value to the right of the symbol.*

*\* Television receiver did not tune to cable channels 53 and 74 with the "B" input port selected.*

#### 4.5.3.3 Input to Output Port Internal Switch Isolation Test Results

Tests were performed on eight VCR's to determine the isolation between the input and output port when the VCR is operating in the "VCR Play" mode. For this test, a VHS test tape was created which contained a 10 IRE flat field picture. The VCR output was selected to channel 3, and a CW signal was input to the VCR at a level of +30 dBmV. The frequency of the CW signal was set to 63.8 MHz or 2.55 MHz above the channel 3 video carrier frequency. With the test tape playing, the VCR channel 3 output spectrum was scanned to identify the 63.8 MHz CW interfering signal. If a signal was present, the level of the signal was measured and the isolation determined.

The test results for the VCR input to output port internal switch isolation are presented in Table 4.9 below.

SAMPLE NO.	ISOLATION (dB)	SAMPLE NO.	ISOLATION (dB)
101	69.3	105	83.9
102	75.8	106	68.1
103	86.4	107	70.5
104	75.4	108	73.6

**Table 4.9 VCR Input to Output Internal Switch Isolation (Channel 3)**

VCR internal switch isolation ranged from a low of 68.1 dB to a high of 86.4 dB. The average isolation was found to be 77.8 dB.

In order to determine whether or not "just perceptible" or greater interference would be caused in any of the VCR's tested, the channel 3 video output carrier level was also measured for each EUT. The video carrier levels ranged from +4.3 dBmV to +5.6 dBmV. A D/U signal ratio of 55 dB is assumed to be the "just perceptible" interference threshold. For an output video carrier level of +5 dBmV, an interfering signal level of -50 dBmV, at the VCR output, would therefore result in "just perceptible" interference. Now, for a maximum expected input signal level

of +15 dBmV, the internal switch isolation must be greater than 65 dB (+15 dBmV - (-50 dBmV)) in order that the interference level is below the "just perceptible" threshold. All eight VCR's tested exhibited internal switch isolation greater than 65 dB.

#### 4.5.4 DPU Backfeed Test Results

DPU backfeed tests were performed on the total sample population of 56 receivers in accordance with the procedures contained in Section 4.4.5. The test results are tabulated in Tables 4.10 through 4.12 for television receivers, VCR's and cable converters, respectively. **The values presented in the tables represent the voltage appearing at the input port of the EUT when the EUT is radiated with a 100 millivolt per meter (100 mV/m) ambient field strength at the EUT's orientation of maximum susceptibility.**

Tests were performed at two different desired input signal levels. Test results on channels 6 and 12 verified that the DPU backfeed voltage level is independent of the desired channel input signal level. Tests performed on channels 78 and 59 (broadcast) showed that the isolation of the directional coupler was insufficient to resolve the DPU backfeed signal for all test samples at the higher input level. For these reasons, only the test results obtained at the 0 dBmV input level are presented here.

Shading is used in the tables to highlight those DPU backfeed voltage levels which could potentially cause "just perceptible" or greater interference in another subscriber's receiver. The threshold level to create "just perceptible" interference in another subscriber's receiver is -33 dBmV as was discussed in Section 4.5.2.1.

The "less than" symbol (<) is used in the tables to indicate that the DPU backfeed voltage level is less than the sensitivity of the measurement system. The value following the "less than" symbol is the measurement system sensitivity for the channel under study.

A review of Table 4.10 indicates that several television receivers generate DPU backfeed signal levels which are greater than the threshold for "just perceptible" interference when radiated with a 100 mv/m ambient field strength. The number of receivers which generate DPU backfeed levels above the interference threshold is highest for cable channel 6 and decreases with increasing frequency. A similar relationship with frequency was observed in the DPU susceptibility tests described in Section 3.0.

**TABLE 4.10  
DPU BACKFEED  
TEST RESULTS**

**TELEVISION RECEIVERS**

SAMPLE NO.	CHANNEL 6 dBmV	CHANNEL 12 dBmV	CHANNEL 78 dBmV	CHANNEL 59 dBmV
001	-34.5	-30.5	< -50.3	< -44.3
002	-34.6	-32.7	-43.7	< -44.3
003	-32.8	-39.3	< -50.3	< -44.3
004	< -59.4	-44.5	-22.2	-28.0
005	-42.5	-43.4	-46.1	< -44.3
006	-51.1	-52.5	-47.7	< -44.3
007	-32.0	-18.5	-13.8	-16.2
008	-36.0	-42.0	-22.3	-27.9
009	-43.0	-42.3	< -50.3	< -44.3
010	-40.6	-45.5	-42.7	< -44.3
011	-24.0	-28.7	-30.8	-42.4
012	-42.3	-41.3	< -50.3	< -44.3
013	-29.3	-30.3	-28.6	-35.5
014	-32.5	-40.7	-46.9	-40.7
015	-42.6	< -56.7	< -50.3	< -44.3
016	-26.4	-27.6	-25.6	-34.7
017	-38.1	-42.0	-47.0	< -44.3
018	-16.7	-29.2	-46.5	< -44.3
019	-12.4	-26.2	-42.5	< -44.3
020	-34.4	-37.9	-45.4	< -44.3
021	-22.6	-13.6	-20.0	-26.1
022	-55.5	-43.9	-47.2	< -44.3
023	-48.9	< -56.7	-50.1	< -44.3
024	-53.3	-49.4	-45.7	< -44.3
025	-43.4	-44.5	< -50.3	< -44.3
026	-58.3	-48.0	< -50.3	< -44.3
027	-19.3	-5.4	-10.9	-23.8
028	-15.1	-6.9	-12.7	-26.8
029	-46.8	-48.2	< -50.3	< -44.3
030	-42.6	-44.5	< -50.3	< -44.3
031	-42.5	-44.6	< -50.3	< -44.3
032	-36.5	-37.2	-38.9	-40.7
033	-31.2	-46.2	< -50.3	< -44.3
034	-20.4	-29.9	-48.4	-35.8
035	-37.4	< -56.7	-49.2	< -44.3

NOTE: A "less than" symbol (<) indicates that the level is less than the measurement system sensitivity.

 Level exceeds "just perceptible" interference threshold.

**TABLE 4.11**  
**DPU BACKFEED**  
**TEST RESULTS**

**VIDEO CASSETTE RECORDER**

SAMPLE NO.	CHANNEL 6 dBmV	CHANNEL 12 dBmV	CHANNEL 78 dBmV	CHANNEL 59 dBmV
101	-56.0	< -56.7	< -50.3	< -44.3
102	-51.8	-52.3	< -50.3	< -44.3
103	-51.7	-35.6	-47.7	< -44.3
104	-57.0	-49.4	< -50.3	< -44.3
105	< -59.4	-51.5	< -50.3	< -44.3
106	-44.8	-37.7	-36.0	< -44.3
107	< -59.4	-41.8	-40.5	-34.3
108	-46.5	-49.1	< -50.3	< -44.3

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*NOTE: A "less than" symbol (<) indicates that the level is less than the measurement system sensitivity.*

 *Level exceeds "just perceptible" interference threshold.*

**TABLE 4.12**  
**DPU BACKFEED**  
**TEST RESULTS**

**CABLE CONVERTERS**

SAMPLE NO.	CHANNEL 6 dBmV	CHANNEL 12 dBmV	CHANNEL 78 dBmV
201	-50.0	< -56.7	< -50.3
203	-42.2	< -56.7	*
204	-53.4	< -56.7	*
206	-44.9	-46.3	< -50.3
208	-56.7	< -56.7	*
209	-55.3	-49.3	< -50.3
212	-56.5	< -56.7	< -50.3
214	-54.1	< -56.7	< -50.3
216	-58.7	< -56.7	< -50.3
218	-59.0	-52.3	< -50.3
220	< -59.4	-53.4	< -50.3
222	-55.6	-41.8	< -50.3
224	-54.4	-49.4	*

**NOTE:** A "less than" symbol (<) indicates that the level is less than the measurement system sensitivity.

\* Cable converter did not tune to this test channel.

 Level exceeds "just perceptible" interference threshold.

Comparison of the DPU backfeed test results of Table 4.10 with the television receiver DPU susceptibility test results (Tables 3.1 through 3.4) reveals that television receivers which are most susceptible to DPU interference produce the highest DPU backfeed signal levels. The highest DPU backfeed voltage measured for a television receiver was -5.4 dBmV, or 27.6 dB above the "just perceptible" interference threshold.

The DPU backfeed signal levels generated by VCR's and cable converters, presented in Tables 4.11 and 4.12, show no levels above the "just perceptible" interference threshold. There are several entries missing in Table 4.12 due to the fact that none of the cable converters tested tuned to broadcast channel 59, and only nine of the thirteen units tuned to cable channel 78.

#### 4.5.5 VCR Through-Loss

The sample population of 8 VCR's was tested for through-loss in accordance with the test procedures contained in Section 4.4.6. Through-loss is defined as the loss between the input and output ports of a VCR when the VCR is operating in the "TV mode." The through-loss test results are tabulated in Table 4.13 below.

Sample No.	VCR Through-Loss (dB)			
	Channel 3	Channel 12	Channel 53	Channel 74
101	3.7	3.4	4.0	3.8
102	3.8	3.8	4.6	5.0
103	3.9	3.5	3.8	3.6
104	4.5	3.7	4.2	3.8
105	3.8	3.9	3.6	4.2
106	4.0	3.5	4.5	4.4
107	4.1	3.5	4.6	4.8
108	3.5	3.4	4.7	4.0

**Table 4.13 VCR Through-Loss Test Results**

The table indicates that the variation in through-loss, for the 8 VCR's tested, is relatively small, ranging from a minimum value of 3.4 dB to a maximum value of 5.0 dB. Averaging the results over the 8 test samples and 4 test channels yields an average VCR through-loss of 4.05 dB.

#### 4.5.6 Adjacent Channel Rejection Test Results

Three sequential adjacent channel rejection tests were performed on each of the 56 test samples in accordance with the test procedures contained in Section 4.4.7. Rejection tests were performed for the following three adjacent channel carriers: lower adjacent color subcarrier, lower adjacent aural carrier, and upper adjacent video carrier. The results are presented in a tabular format in terms of the measured receiver rejection and the resultant equivalent desired to undesired (D/U) signal ratio.

The use of the "greater than" symbol ( $>$ ) in the tables of this section indicates that the rejection or D/U signal ratio is greater than the value to the right of the symbol. The use of the "greater than" symbol also indicates that the receiver adjacent channel rejection was sufficiently high, such that the resultant baseband interfering signal was below the noise floor of the EUT.

Shading is used in the tables to highlight receiver performance which results in "just perceptible" or greater interference in the received picture. A D/U signal ratio of 55 dB, referenced to the input of the receiver, is assumed to be the "just perceptible" interference threshold.

##### 4.5.6.1 Lower Adjacent Channel Color Subcarrier Test Results

Lower adjacent color subcarrier rejection tests were performed with the desired video carrier level set to +10 dBmV and the lower adjacent channel color subcarrier level set to -2 dBmV. The desired aural carrier level was set to 0 dBmV. Test results are presented in Tables 4.14 through 4.16 for television receivers, VCR's, and cable converters, respectively.

A review of Table 4.14 indicates that seven of the thirty-five television receivers tested exhibited interference levels greater than the "just perceptible" interference threshold on at least one channel. The majority of the receivers exhibited D/U ratios greater than 60 dB for the maximum expected level of the lower adjacent color subcarrier (-2 dBmV). The worst interference level produced in a television receiver was 13 dB greater than the "just perceptible" threshold.



**TABLE 4.14**  
**LOWER ADJACENT CHANNEL**  
**COLOR SUBCARRIER REJECTION**  
**TEST RESULTS**

**TELEVISION RECEIVERS**

SAMPLE NO.	CHANNEL 3		CHANNEL 12		CHANNEL 53		CHANNEL 74	
	REJ.	D/U	REJ.	D/U	REJ.	D/U	REJ.	D/U
001	50.1	62.1	57.3	49.3	48.3	60.3	50.6	62.6
002	48.1	60.1	49.2	61.2	45.8	57.8	45.3	57.3
003	> 63.2	> 75.2	63.4	75.4	63.9	75.9	63.9	75.9
004	58.6	70.6	58.2	70.2	56.8	68.8	*	*
005	61.6	73.6	51.2	63.2	47.8	59.8	50.6	62.6
006	45.1	57.1	47.2	59.2	42.8	54.8	43.1	55.1
007	> 60.6	> 72.6	> 63.2	> 75.2	> 62.8	> 74.8	> 65.1	> 77.1
008	58.1	70.1	60.2	72.2	> 64.3	> 76.3	59.1	71.1
009	61.1	73.1	50.7	62.7	48.8	60.8	52.1	64.1
010	58.3	70.3	46.2	58.2	44.2	56.2	51.1	63.1
011	54.1	66.1	53.2	65.2	54.3	66.3	54.1	66.1
012	46.6	58.6	44.2	56.2	43.8	55.8	44.1	56.1
013	44.1	56.1	40.2	52.2	37.3	49.3	44.1	56.1
014	35.6	47.6	32.2	44.2	29.8	41.8	32.1	44.1
015	47.6	59.6	44.2	56.2	41.8	53.8	45.6	57.6
016	56.1	68.1	55.2	67.2	54.3	66.3	56.1	68.1
017	53.1	65.1	52.2	64.2	49.8	61.8	53.6	65.6
018	43.6	55.6	40.2	52.2	40.3	52.3	42.8	54.8
019	40.8	52.8	38.7	50.7	39.8	51.8	39.8	51.8
020	51.1	63.1	51.7	63.7	48.8	60.8	48.1	60.1
021	50.2	62.2	47.2	59.2	45.8	57.8	45.1	57.1
022	58.4	70.4	53.7	65.7	49.8	61.8	> 63.6	> 75.6
023	48.1	60.1	44.2	56.2	43.8	55.8	45.1	57.1
024	57.6	69.6	59.2	71.2	56.3	68.3	57.1	69.1
025	54.6	66.6	48.7	60.7	46.8	58.8	48.1	60.1
026	49.1	61.1	47.7	59.7	46.3	58.3	48.1	60.1
027	54.6	66.6	48.7	60.7	47.8	59.8	46.1	58.1
028	56.6	68.6	54.7	66.7	54.8	66.8	56.6	68.6
029	61.6	73.6	59.6	71.6	58.7	70.7	> 58.1	> 70.1
030	54.6	66.6	50.7	62.7	50.3	62.3	48.1	60.1
031	50.1	62.1	46.2	58.2	47.3	59.3	45.6	57.6
032	49.6	61.6	50.2	62.2	51.3	63.3	54.1	66.1
033	> 60.6	> 72.6	> 61.2	> 73.2	> 57.8	> 69.8	> 58.6	> 70.6
034	55.6	67.6	57.2	69.2	57.8	69.8	53.1	65.1
035	46.1	58.1	43.2	55.2	44.8	56.8	51.6	63.6

NOTE: A "greater than" symbol (>) indicates rejection or D/U ratio is greater than the value to the right of the symbol.  
 \* Test sample did not tune to this channel.

 Level exceeds "just perceptible" interference threshold.